Physical therapy for the brain

Treating certain ailments without drugs is possible with neurofeedback. It lets patients view and modify their mind's activity.

By Eric Jaffe, Special to The Times
November 27, 2006

EVERY week for two years, Michael Hammett stared at a computer screen, trying to open a flower with his mind.

Hammett had developed a case of carpal tunnel syndrome so severe he needed surgery. But being a former opiate abuser, he refused to use the medications that would be needed to control the resulting pain. Having already tried physical therapy, he set his mind on another alternative: neurofeedback.

In neurofeedback, people with mental or psychological conditions learn to regulate and reduce their symptoms — in Hammett's case, pain — by monitoring their brain waves on a computer. The treatment is an increasingly popular cousin to biofeedback, in which people control physical stress by monitoring their heart rate or muscle tension.

Hammett learned to do both. Electrodes attached to his scalp transmitted electrical signals from his brain to a computer displaying a closed white flower. Other sensors were attached to muscles in both his hands and arms. As Hammett learned what it felt like to relax these muscles, and therefore reduce his pain, the flower began to open. Over time, he trained his brain to calm his central nervous system whenever the pain recurred.

"That image of the flower opening is so burned into my psyche, in conjunction with the moment of relaxation," the 48-year-old Santa Monica resident says, three years after finishing his therapy.

Neurofeedback has been used for decades in private clinics, but few well-controlled research studies have been done — giving it an unscientific reputation. That's beginning to change.

Researchers are now studying and refining the therapy — with promising results. Neurofeedback is being used to treat a growing number of conditions, including chronic pain, attention-deficit hyperactivity disorder, asthma, migraines, post-traumatic stress disorder, substance abuse, autism and a variant of autism called Asperger's syndrome.

"We've done some definitive studies finally that show it works in important ways," says Eran Zaidel, a professor of behavioral neuroscience and cognition at UCLA's Brain Research Institute.

"It's still considered an alternative approach to medicine, but some people won't do conventional medicine at all," he says. "Many, many people are very eager to use this method."

Studies show the advantages

Neurofeedback therapy emerged from work done in the 1960s by psychologist Barry Sterman, now professor emeritus at the

Mark Boster / LAT

NEUROFEEDBACK: A patient watches a video game of a jet that flies once the desired brain-wave pattern is produced.

Performers, athletes see a new way to focus

Performers and athletes are also discovering the benefits of neurofeedback and a related form of biofeedback to help them focus mentally and remain calm under pressure.

"The most dangerous thing for a performer is to get ahead or behind themselves," says John Cheek, a bass singer with the New York Metropolitan Opera. "That's what the neurofeedback helps you do — to stay in that moment."

To train Cheek, psychotherapist Rae Tattenbaum applies electrodes to the singer's scalp. These sensors send electrical signals to a computer. When the signals appear blue and a Tibetan bell sounds, Cheek knows his brain is relaxed and calm. When Tattenbaum sees an abnormal brainwave, she tells Cheek to refocus.

Over time, Cheek's brain reaches a relaxed state naturally, enabling him to tune out distractions and concentrate on his delivery.

UCLA School of Medicine. He wired electrodes to the heads of cats, then rewarded them whenever their brain waves reached a frequency that indicated a relaxed state. In subsequent experiments, Sterman found, cats that had learned to relax themselves this way had a higher resistance to the onset of seizures.

The medical applications seemed obvious: If people learned to relax in such a way, they too might be able to stave off seizures or anxiety attacks.

Such a method has advantages over simply taking a pill, says Rob Kall, a neurofeedback practitioner in Newtown, Penn. "When you're done with medication, it goes out of your system," Kall says. But when you're done with neurofeedback training, the benefits remain.

Perhaps the most researched and accepted application of neurofeedback is with patients who suffer from ADHD.

In 2002, a clinical team led by psychology professor Vincent J. Monastra, director of the FPI Attention Disorders Clinic in Endicott, N.Y., studied 100 children diagnosed with the condition. All the patients received Ritalin and counseling, but about half also received neurofeedback. Every week, Monastra hooked electrodes to the frontal cortex of these patients and taught them to increase arousal in that area. Heightened frontal cortex activity reflects a reduction in hyperactivity and improvements in attention.

After a year, all the patients showed some improvement. But when the researchers discontinued treatment for a week and reevaluated the patients, only those who received neurofeedback retained those improvements.

The neurofeedback appeared to actually change the patients' brain patterns, the research found, and neurological tests showed greater activity in the parts of the brain responsible for attention and behavioral control. The study was published in the December 2002 issue of the journal Applied Psychophysiology and Biofeedback.

Between drugs and neurofeedback, only the latter can potentially offer long-lasting change, says clinical psychologist Roger deBeus of Eastern Virginia Medical School in Norfolk, Va. "As the brain becomes more normal, patients don't need as much or any medication," he says.

Russ Ramsay, associate director of the Adult ADHD Treatment and Research Program at the University of Pennsylvania, says patients are intrigued by the possibilities. "More people are seeking it out and entering into the treatment," he says. Cravings can be lessened with neurofeedback too. Clinical psychologist Stephen Sideroff of the UCLA School of Medicine published the first controlled study examining neurofeedback as a tool to help substance abusers. The study enrolled 120 patients from a residential treatment program in Los Angeles; the group included those who were dependent on alcohol, heroin, crack and methamphetamine.

In addition to counseling, half the patients received neurofeedback, in which they learned to stabilize certain brain

waves related to stress that comes with the initial phases of substance abuse recovery. After a year of treatment, 77% of the users who had received neurofeedback training remained abstinent, compared with 44% of the control patients, according to research published in 2005 in the American Journal of Drug and Alcohol Abuse.

Precision up for debate

Some critics of neurofeedback have said it's too imprecise. Electrodes placed on the scalp can detect brain waves toward the surface of the brain, they say, but might fail to measure waves at sub-cortical levels, such as those involved in attention and arousal regulation. Several advances in neurofeedback, however, promise more precise readings.

Monastra now uses a technique known as multi-channel neurofeedback. Instead of focusing on just one part of the brain, the technique gives readings from many brain regions.

"As we become more aware of the different subtypes of neurological problems, we use specific protocols to address those problems," he says. "Chances are we'll start to get even more robust results."

Multi-channel neurofeedback surveys the brain's surface to locate an abnormality, but another type of therapy actually looks into the core. The therapy — low-resolution electromagnetic tomography — can show clinicians signals from regions deep below the scalp.

"The idea is, if we can get more specific, we can intervene faster and more effectively," says Leslie Sherlin, who is getting his doctorate in psychology at Capella University in Minnesota.

In tests with obsessive-compulsive patients, Sherlin located increased neural activity in the cingulate gyrus, an area toward the brain's core that's involved in regulating attention and arousal.

Over-arousal in this area causes patients to ruminate on germs or other obsessions, he says. Teaching patients to regulate the brain waves from the gyrus could lead to improved treatment of obsessive-compulsive disorder, according to an analysis of the technique that Sherlin published in Neuroscience Letters in 2005.

Promising but not yet accepted

Neurofeedback has yet to achieve widespread acceptance. "Many people out there feel threatened by it, because people are putting it out there as alternative," says psychologist Jeffrey Bone, who runs a private practice in Orange County and began using neurofeedback a year ago.

"I see it as a complement to medicine or psychotherapy, not a challenge or alternative."

But neurofeedback researchers expect acceptance of the therapy to grow.

For starters, the therapy is cost effective, they say. In the case of asthma, for example, if a biofeedback session costs about $ 150 — a typical rate in most clinics (neurofeedback costs about the same) — then the patient has acquired an unlimited therapeutic tool for the price of about four months of steroid medication, says Paul Lehrer, professor of psychiatry at Robert Wood Johnson Medical School in New Jersey.

Says UCLA's Sideroff: "There are a lot of obstacles. But it's an effective tool, so I think it will keep growing."